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EXAMINER	
CROWELL, ANNA M	
ART UNIT	PAPER NUMBER
1763	11

DATE MAILED: 06/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/821,027	CHEN ET AL.	
	Examiner	Art Unit	
	Michelle Crowell	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25, 28-33* is/are pending in the application.

4a) Of the above claim(s) *1-10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-25 and 28-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Per applicant's request, claims 26 and 27 were cancelled.

Election/Restrictions

2. Applicant's election with traverse of claims 11-25, and 28-30 in Paper No. 4 is acknowledged. The traversal is on the ground(s) that the inventions of claims 1 and 31 are not separate and distinct. This is not found persuasive because (1) restriction is based on claims as originally filed and claims 1 and 31 have different classifications.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 11-25 and 31-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 11, 17, 20, 23, 25, and 31-33 recite the limitation, "plural parallel **connected** windings". It is unclear how the windings are connected in parallel.

In claim 11, the phrase, "so that for different distribution of electromagnetic fields **the coil supplies to plasma of the processor** different amounts of total power are applied to the plural parallel connected windings" is confusing.

In claims 21-23, the phrase, "remainder of the coil" is confusing. Examiner suggests changing that phrase to "**another of the windings**". Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

6. Claims 11 is rejected under 35 U.S.C. 102(b) as being anticipated by Ishii et al. (U.S. 5,571,366).

Referring to Figure 17, and column 13, line 32-column 14, line 7, lines 21-42, Ishii et al. discloses an inductive plasma processor 1 for processing a workpiece W, comprising a plasma excitation coil 6, the coil including plural parallel connected windings 81 and 82, a source 7a and 7b for supplying power to the plural parallel connected windings, variable impedance arrangements 8a and 8b respectively coupled with the plural parallel connected windings for varying the currents flowing from the source to each of the plural parallel connected windings, and a controller 37 for varying the total power the source supplies to the plural parallel connected windings and components of the variable impedance arrangements so that for different distribution of electromagnetic fields the coil supplies to plasma of the processor different

amounts of total power are applied to the plural parallel connected windings (col. 13, lines 57-59, col. 14, lines 29-42).

7. Claims 11 and 31 are rejected under 35 U.S.C. 102(a) as being anticipated by Chu et al. (U.S. 6,051,073).

Referring to Figure 2 and column 5, line 48-column 6, line 16, Chu et al. discloses an inductive plasma processor 200 for processing a workpiece 203, comprising a plasma excitation coil , the coil including plural parallel connected windings 40, a source 66 for supplying power to the plural parallel connected windings (col. 5, lines 50-51), variable impedance arrangements 50 and 58 respectively coupled with the plural parallel connected windings for varying the currents flowing from the source to each of the plural parallel connected windings, and a controller 62 for varying the total amount of power applied to the plural parallel connected windings so that for different distributions of electromagnetic fields different amounts of total power are applied to the plural parallel connected windings (col. 5, lines 57-60), and the amount of current applied to the individual plural windings of the plural parallel connected windings so that for different distributions of electromagnetic fields different amounts of current are applied to the individual windings (col. 5, lines 50-55).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 12, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (U.S. 6,052,073).

Regarding claim 12, the apparatus of Chu et al. is capable of controlling the total power and the variable impedance arrangements in the different windings. Therefore, it would have been an obvious choice of design to one of ordinary skill in the art to arrange the controller so that the current flowing in one of the windings will be substantially constant while the current in the remaining winding changes in order to control the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

Regarding claims 32-33, the apparatus of Chu et al. includes plural parallel windings arranged so one of the windings is an exterior winding 40 located so electromagnetic fields generated by it are in proximity to a peripheral wall 14 of the chamber, and electromagnetic fields generated by the remainder of the coil 40 are remote from the chamber peripheral wall. The controller of Chu et al. is capable of varying the total power and the current in the each winding. Therefore, it would have been an obvious choice of design to one of ordinary skill in

the art to arrange the controller so that the current applied to the exterior winding is varied in order that the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil in order to control the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

11. Claims 11, 12, and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (U.S. 5,907,221) in view of Tomioka et al. (U.S. 5,897,713) or Chu et al. (U.S. 6,052,073).

Referring to Figure 6 and column 4, lines 4-26, Sato et al. discloses an inductive plasma processor for processing a workpiece 35, comprising a plasma excitation coil, the coil including plural parallel connected windings 150a-k, a source 170 for supplying power to the plural parallel connected windings, variable impedance arrangements 160a-k and 165a-k respectively coupled with the plural parallel connected windings for varying the currents flowing from the source to each of the plural parallel connected windings (col.4, lines 16-21), and a controller 180 for varying the amount of current applied to the individual plural windings of the plural parallel connected windings so that for different distributions of electromagnetic fields different amounts of current are applied to the individual winding.

Sato et al. fails to teach a controller for varying the total amount of power applied to the plural parallel connected windings.

Referring to column 8, lines 34-37, Tomioka et al. teaches an inductive plasma processor comprising a controller 14 for varying the total power the source supplies to the plural parallel

connected windings. By using a controller, the frequency, phase, and power of the source 7 are controlled. Similarly, referring to column 4, lines 18-20, Chu et al. teaches an inductive plasma processor comprising a controller 62 for varying the total power the source supplies to the plural parallel connected windings. By using a controller, the frequency, phase, and power of the source 66 are controlled. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a controller for varying the total amount of power applied to the plural parallel connected windings as taught by Tomioka et al. or Chu et al. in the apparatus of Sato et al. because this allow the frequency, phase, and power of the source to be controlled.

Regarding claim 12, the apparatus of Sato et al. in view of Tomioka et al or Chu et al. is capable of controlling the total power and the variable impedance arrangements in the different windings. Therefore, it would have been an obvious choice of design to one of ordinary skill in the art to arrange the controller so that the current flowing in one of the windings will be substantially constant while the current in the remaining winding changes in order to control the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

Regarding claims 32-33, the apparatus of Sato et al. in view of Tomioka et al or Chu et al. includes plural parallel windings arranged so one of the windings is an exterior winding 40 located so electromagnetic fields generated by it are in proximity to a peripheral wall 14 of the chamber, and electromagnetic fields generated by the remainder of the coil 40 are remote from the chamber peripheral wall. The controller of Chu et al. is capable of varying the total power and the current in the each winding. Therefore, it would have been an obvious choice of design to one of ordinary skill in the art to arrange the controller so that the current

applied to the exterior winding is varied in order that the electromagnetic field generated by the exterior winding exceeds, is less than, or is the same as the electromagnetic field generated by the remainder of the coil in order to control the distribution and the uniformity of the plasma, therefore controlling the process being performed within the apparatus.

12. Claims 13-25, and 28-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (U.S. 6,052,073) in view of Chen et al. (WO 00/00993).

The teachings of Chu et al. have been discussed above.

Chu et al. fails to specifically teach varying the location and the value of the maximum amplitude of a standing wave in the windings.

Referring to Figures 3, 4, 6, and page 6, line 19 – page 7, line 22, page 8, line 4 – page 13, line 12, and page 14, line 19 – page 16, line 6, Chen teaches an inductive plasma processor wherein each of the impedance arrangements includes a variable reactance C1-C4 coupled to its respective winding coil 1 and coil 2, the variable reactance of each impedance arrangement being arranged for varying the location (page 15, line 25-page 16, line 6) and the value of the maximum amplitude (page. 6, lines 19-24) of a current in its respective winding. By varying the location and the value of the maximum amplitude of the current in the respective windings, the plasma density in different radial and azimuthal regions can be varied and controlled, and therefore, radially and azimuthally uniform plasma can be achieved (abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the location and the value of the maximum amplitude of a standing wave in the respective windings as taught by Chen et al. in the apparatus of Chu et al. since the controller of Chu et al. is capable

of varying the variable reactance of each impedance arrangement, and furthermore uniform plasma is achieved.

Chu et al. fails to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Chen et al. teaches an inductive plasma processor wherein each of the windings coil 1 and coil 2 including first and second end terminals and each of the impedance arrangements includes first and second capacitors C1-C4, each of the first capacitors C1 and C2 being connected in series with its respective first terminal for supplying RF energy from the RF source to the respective winding, each of the second capacitors in series with its respective second terminal and ground (Figures 4 and 6, page 8, lines 4-24, page 15, lines 4-8). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught by Chen et al. in the apparatus of Chu et al. since a more symmetric current distribution is achieved along the coil.

13. Claims 13-25, and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. (U.S. 5,907,221) in view of Tomioka et al. (U.S. 5,897,713) or Chu et al. (U.S. 6,052,073) as applied to claims 11, 12, and 31-33 above, and further in view of Chen et al. (WO 00/00993).

The teachings of Sato et al. in view of Tomioka et al. or Chu et al. have been discussed above.

Sato et al. in view of Tomioka et al. or Chu et al. fails to specifically teach varying the

location and the value of the maximum amplitude of a standing wave in windings.

Referring to Figures 3, 4, 6, and page 6, line 19 – page 7, line 22, page 8, line 4 – page 13, line 12, and page 14, line 19 – page 16, line 6, Chen teaches an inductive plasma processor wherein each of the impedance arrangements includes a variable reactance C1-C4 coupled to its respective winding coil 1 and coil 2, the variable reactance of each impedance arrangement being arranged for varying the location (page 15, line 25-page 16, line 6) and the value of the maximum amplitude (page. 6, lines 19-24) of a current in its respective winding. By varying the location and the value of the maximum amplitude of the current in the respective windings, the plasma density in different radial and azimuthal regions can be varied and controlled, and therefore, radially and azimuthally uniform plasma can be achieved (abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the location and the value of the maximum amplitude of a standing wave in the respective windings as taught by Chen et al. in the apparatus of Sato et al. in view of Tomioka et al. or Chu et al since the controller of Sato et al. in view of Tomioka et al. or Chu et al. is capable of varying the variable reactance of each impedance arrangement, and furthermore uniform plasma is achieved.

Sato et al. in view of Tomioka et al. or Chu et al. fail to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Chen et al. teaches an inductive plasma processor wherein each of the windings coil 1 and coil 2 including first and second end terminals and each of the impedance arrangements includes first and second capacitors C1-C4, each of the first capacitors C1 and C2 being connected in series with its respective first terminal for supplying RF energy from the RF source to the respective winding, each of the second capacitors in series with its respective second

terminal and ground (Figures 4 and 6, page 8, lines 4-24, page 15, lines 4-8). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught by Chen et al. in the apparatus of Sato et al. in view of Tomioka et al. or Chu et al. since a more symmetric current distribution is achieved along the coil.

14. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (U.S. 6,052,073) in view of van Gogh et al. (U.S. 6,579,426).

The teachings of Chu et al. have been discussed above.

Chu et al. fails to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Van Gogh et al. teaches an inductive plasma processor wherein a winding 104 including a first and second end terminals b and d and each of the impedance arrangements includes first and second capacitors 310 and 308, each of the first capacitors 310 and 308 being connected in series with its respective first terminal for supplying RF energy from the RF source to the respective winding, each of the second capacitors in series with its respective second terminal and ground (Figures 2 and 3, col.4, lines 54-64, col. 5, line 45 - col. 6, line 6). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught

by van Gogh et al. in the apparatus of Chu et al. since a more symmetric current distribution is achieved along the coil.

15. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al. in view of Tomioka et al. as applied to claims 11, 12, and 31-33 above, and further in view of van Gogh et al. (U.S. 6,579,426).

The teachings of Sato et al. in view of Tomioka et al. or Chu et al. have been discussed above.

Sato et al. in view of Tomioka et al. or Chu et al. fails to teach each of the windings including first and second end terminals which are connected to first and second capacitors.

Van Gogh et al. teaches an inductive plasma processor wherein a winding 104 including a first and second end terminals b and d and each of the impedance arrangements includes first and second capacitors 310 and 308, each of the first capacitors 310 and 308 being connected in series with its respective first terminal for supplying RF energy from the RF source to the respective winding, each of the second capacitors in series with its respective second terminal and ground (Figures 2 and 3, col.4, lines 54-64, col. 5, line 45 - col. 6, line 6). By providing two capacitors for each coil, a more symmetric current distribution is achieved along the coil. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for each winding to have first and second capacitors connected to first and second end terminals as taught by van Gogh et al. in the apparatus of Sato et al. in view of Tomioka et al. or Chu et al. since a more symmetric current distribution is achieved along the coil.

Response to Arguments

16. Applicant's arguments with respect to claims 11-25 and 28-33 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee et al teaches plural parallel connected windings with a variable impedance network.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (703) 305-1956. The examiner can normally be reached on M-F (8:00 - 4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Luz L. Alejandro
Primary Examiner
Art Unit 1763

AMC
June 20, 2003